REMARKS

Applicant has amended the claims to clarify what is being claimed. In particular, Claim 1, 3, 12, 14 and 17-21 have been amended.

The Examiner has rejected Claims 1-16, 18-21 under 35 USC 102(e) as being anticipated by Mao et al (US 6,490,140). The Examiner has further rejected Claim 17 under 35 USC 103(a) as being unpatentable over Mao et al. Such rejections are deemed overcome by the amendments made hereinabove. Specifically, all of the independent claims now require an "upper layer [that] has a thickness less than 20 A."

The Examiner has relied on the following excerpt from Mao to render such feature (originally the subject matter of Claims 3 and 14) anticipated.

> "The thickness of seed layer 12 is preferably in the range of about 20 A to about 60 A, and more preferably in the range of about 45 A to about 50 A." (col. 8, line 6)

Such excerpt, however, teaches a range with a minimum of 20A. Applicant avoids such prior art range by claiming an "upper layer [that] has a thickness less than 20 A," a feature found nowhere in the prior art in the context of the remaining claimed details.

Such range is beneficial in that it improves the GMR ratio ($\Delta R/R$) of the resultant sensor. For support of such assertion, see, for example, the following excerpt from lines 21-24 on page 13 of applicant's originally filed specification. See also pages 14-16 and the accompanying figures.

> "In one embodiment of the present invention, the upper layer 508 may be deposited with a thickness of at least 4 A.

Optionally, the upper layer 508 may have a thickness of no more than 10 A after which benefits are abated. Further, the upper layer 508 may have a thickness of no more than 20A after which benefits are seriously abated."

By virtue of the dependence of the remaining claims, such claims are also deemed allowable. In the event a telephone conversation would expedite the prosecution of this application, the Examiner may reach the undersigned at (408) 971-2573. For payment of any additional fees due in connection with the filing of this paper, the Commissioner is authorized to charge such fees to Deposit Account No. 09-0466 (Order No. IBM1P002/SJ09-2000-0121US1).

Respectfully submitted,

By: _____ Date: 04/07/03

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Appendix 1

Amended and new claims are denoted with (AMENDED) and (NEW), respectively.

NOTE: Underlining denotes added text. Brackets denote deleted text.

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1. (Amended) A spin valve (SV) sensor comprising:

a pinned layer having a pinned layer magnetization;

a free layer disposed adjacent the pinned layer, the free layer having a free layer magnetization perpendicular to the pinned layer magnetization in the absence of an external field;

a spacer layer disposed between the free layer and the pinned layer;

a pinning layer disposed adjacent the pinned layer for fixing the pinned layer magnetization;

an underlayer disposed adjacent the pinning layer, the underlayer comprising NiFeX; and

an upper layer disposed adjacent the underlayer and the pinning layer, the upper layer comprising a material selected from the group consisting of NiFe and CoFe for increasing a GMR ratio associated with the SV sensor;

wherein the upper layer has a thickness less than 20 A.

2. The spin valve sensor as recited in claim 2, wherein the upper layer has a thickness of at least 4 A.

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3. (Amended) The spin valve sensor as recited in claim 5, wherein the upper layer has a thickness of no more than [20]10 A.

4. The spin valve sensor as recited in claim 1, wherein the upper layer is doped.

5. The spin valve sensor as recited in claim 1, wherein the underlayer comprises NiFeCr..

6. The spin valve sensor as recited in claim 1, wherein the SV sensor is a component of a disk drive system.

7. The spin valve sensor as recited in claim 1, wherein the underlayer includes 40 +/- 5 Atomic % Cr.

8. The spin valve sensor as recited in claim 1, wherein the pinned layer comprises a Ru layer.

9. The spin valve sensor as recited in claim 8, wherein the pinned layer further comprises a first CoFe layer disposed adjacent a first side of the Ru layer and a second CoFe layer disposed adjacent a second side of the Ru layer.

10. The spin valve sensor as recited in claim 1, wherein the free layer comprises a NiFe layer.

11. The spin valve sensor as recited in claim 10, wherein the free layer further comprises a CoFe layer disposed adjacent the NiFe layer.

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12. (Amended) A method of fabricating a spin valve (SV) sensor comprising:

depositing an underlayer comprising NiFeX;

depositing an upper layer adjacent the underlayer, the upper layer comprising a material selected from the group consisting of NiFe and CoFe for increasing a GMR ratio associated with the SV sensor;

depositing a pinning layer adjacent the upper layer;

depositing a pinned layer adjacent the pinning layer, the pinned layer having a pinned layer magnetization;

depositing a spacer layer adjacent the pinned layer; and

depositing a free layer adjacent the pinned layer, the free layer having a free layer magnetization perpendicular to the pinned layer magnetization in the absence of an external field;

wherein the upper layer has a thickness less than 20 A.

13. The method as recited in claim 12, wherein the upper layer has a thickness of at least 4 A.

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14. (Amended) The method as recited in claim 13, wherein the upper layer has a thickness of no more than [20]10 A.

15. The method as recited in claim 12, wherein the upper layer is doped.

Subcl Cont

16. The method as recited in claim 12, wherein the underlayer includes NiFeCr.

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17. (Amended) A spin valve (SV) sensor comprising:

a pinned layer having a pinned layer magnetization;

a free layer disposed adjacent the pinned layer, the free layer having a free layer magnetization perpendicular to the pinned layer magnetization in the absence of an external field;

a spacer layer disposed between the free layer and the pinned layer;

a pinning layer disposed adjacent the pinned layer for fixing the pinned layer magnetization, the pinning layer comprising PtMn;

an underlayer disposed adjacent the pinning layer, the underlayer comprising NiFeCr; and

an upper layer disposed adjacent the underlayer and the pinning layer, the upper layer comprising CoFe for increasing a GMR ratio associated with the SV sensor;

wherein the upper layer has a thickness less than 20 A.

18. (Amended) A spin valve (SV) sensor comprising:

a pinned layer having a pinned layer magnetization;

a free layer disposed adjacent the pinned layer, the free layer having a free layer magnetization perpendicular to the pinned layer magnetization in the absence of an external field;

a spacer layer disposed between the free layer and the pinned layer;

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a pinning layer disposed adjacent the pinned layer for fixing the pinned layer magnetization, the pinning layer comprising PtMn;

an underlayer disposed adjacent the pinning layer, the underlayer comprising NiFeCr; and

an upper layer disposed adjacent the underlayer and the pinning layer, the upper layer comprising NiFe for increasing a GMR ratio associated with the SV sensor;

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wherein the upper layer has a thickness less than 20 A.

19. (Amended) A spin valve (SV) sensor comprising:

a pinned layer having a pinned layer magnetization;

a free layer disposed adjacent the pinned layer, the free layer having a free layer magnetization perpendicular to the pinned layer magnetization in the absence of an external field;

a pinning layer disposed adjacent the pinned layer for fixing the pinned layer magnetization;

an underlayer disposed adjacent the pinning layer, the underlayer comprising NiFeCr; and

an upper layer disposed adjacent the underlayer and the pinning layer, the upper layer comprising a material selected from the group consisting of NiFe and CoFe for increasing a GMR ratio associated with the SV sensor;

wherein the upper layer has a thickness [between] at least 4 A and less than 20A.

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20. (Amended) A spin valve (SV) sensor comprising:

a pinned layer having a pinned layer magnetization, the pinned layer comprising a Ru layer with a first CoFe layer disposed adjacent a first side of the Ru layer and a second CoFe layer disposed adjacent a second side of the Ru layer;

a free layer disposed adjacent the pinned layer, the free layer having a free layer magnetization perpendicular to the pinned layer magnetization in the absence of an external field, the free layer comprising a NiFe layer with a third CoFe layer disposed adjacent thereto;

a spacer layer disposed between the free layer and the pinned layer;

a pinning layer disposed adjacent the pinned layer for fixing the pinned layer magnetization, the pinning layer comprising PtMn;

an underlayer disposed adjacent the pinning layer, the underlayer comprising NiFeCr; and

an upper layer disposed adjacent the underlayer and the pinning layer, the upper layer comprising a material selected from the group consisting of NiFe and CoFe for increasing a GMR ratio associated with the SV sensor;

wherein the upper layer has a thickness less than 20 A.

21. (Amended) A disk drive system, comprising:

a magnetic recording disk;

a spin valve (SV) sensor including:

a pinned layer having a pinned layer magnetization;

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a free layer disposed adjacent the pinned layer, the free layer having a free layer magnetization perpendicular to the pinned layer magnetization in the absence of an external field,

a spacer layer disposed between the free layer and the pinned layer,

a pinning layer disposed adjacent the pinned layer for fixing the pinned layer magnetization,

an underlayer disposed adjacent the pinning layer, the underlayer comprising NiFeX, and

an upper layer disposed adjacent the underlayer and the pinning layer, the upper layer comprising a material selected from the group consisting of NiFe and CoFe for increasing a GMR ratio associated with the SV sensor;

an actuator for moving the SV sensor across the magnetic recording disk so the SV sensor may access different regions of magnetically recorded data on the magnetic recording disk; and

a controller electrically coupled to the SV sensor for detecting changes in resistance of the SV sensor;

wherein the upper layer has a thickness less than 20 A.